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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/782,545	02/19/2004	Martin R. Roscheisen	NSL-025	2677
27652	7590	05/25/2005	EXAMINER	
JOSHUA D. ISENBERG 204 CASTRO LANE FREMONT, CA 94539			ABRAMOWITZ, HOWARD E	
			ART UNIT	PAPER NUMBER
			1762	

DATE MAILED: 05/25/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

**Application No.**

10/782,545

**Applicant(s)**

ROSCHISEN ET AL.

**Examiner**

Howard E. Abramowitz

**Art Unit**

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**– The MAILING DATE of this communication appears on the cover sheet with the correspondence address –**  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 2/19/2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-33 is/are pending in the application.
- 4a) Of the above claim(s) 6-13 and 24-33 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-5 and 14-21 is/are rejected.
- 7) ☒ Claim(s) 22 and 23 is/are objected to.
- 8) ☒ Claim(s) 1-33 are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>2/19/04</u> . | 6) <input type="checkbox"/> Other: _____  |

nd

### **DETAILED ACTION**

Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claims 1-23, drawn to group I, classified in class 427, subclass 248.1.
- II. Claims 24-33, drawn to group II, classified in class 118, subclass 715.

The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the coils could be formed without using a winding mechanism.

This application contains claims directed to the following patentably distinct species of the claimed invention: atomic layer deposition, anodization, drying, annealing, exposure to reactive gas or vapor, electrodeposition, electropolishing.

Applicant is required under 35 U.S.C. 121 to elect a single disclosed species for prosecution on the merits to which the claims shall be restricted if no generic claim is finally held to be allowable. Currently, claims 1, 14-23 are generic.

Applicant is advised that a reply to this requirement must include an identification of the species that is elected consonant with this requirement, and a listing of all claims readable thereon, including any claims subsequently added. An argument that a claim is allowable or that all claims are generic is considered nonresponsive unless accompanied by an election.

Upon the allowance of a generic claim, applicant will be entitled to consideration of claims to additional species which are written in dependent form or otherwise include all the limitations of an allowed generic claim as provided by 37 CFR 1.141. If claims are added after the election, applicant must indicate which are readable upon the elected species. MPEP § 809.02(a).

Should applicant traverse on the ground that the species are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the species to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103(a) of the other invention.

During a telephone conversation with Joshua Isenberg on 5/13/05 a provisional election was made without traverse to prosecute the invention of group I, claims 1 and 14-23, and the species claims 2-5. Affirmation of this election must be made by applicant in replying to this Office action. Claims 6-13 and 24-33 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

***Specification***

The specification requires updating to include the serial numbers and/or patent numbers of the cross-referenced applications.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

Claims 1, 19-21 are rejected under 35 U.S.C. 102(b) as being anticipated by Iszczukiewicz (US Patent No. 3,923,556).

Referring to claim 1, Iszczukiewicz discloses a method of treating a substrate surface comprising coiling a substrate into one or more coils in such a way that adjacent turns of the coil do not touch one another (column 1 lines 56-63, figure 1).

Iszczukiewicz also discloses by reference (US Patent No. 3,114,539) annealing the coiled substrates in a furnace purged with inert gas.

Referring to claims 19-21, Iszczukiewicz discloses forming an open coil (adjacent turns of the coil do not touch one another) by simultaneously winding a spacer band with the substrate, the spacer tape is oriented parallel to the length of the substrate and

has passages running along the width of the spacer band to permit the passage of gas (column 1 lines 57-63, figure 1).

Claims 1 and 2 are rejected under 35 U.S.C. 102(e) as being anticipated by Chan et al. (6,716,693).

Referring to claims 1 and 2, Chan et al. discloses a method of treating a substrate surface comprising coiling a substrate into one or more coils in such a way that adjacent turns of the coil do not touch one another. Here the term coiling is taken in its broadest reasonable interpretation, which is, to form coils. Chan et al. form coils by etching away a sacrificial silicon nitride layer (figure 5a, column 5-6 lines 57-34). Chan et al. place the substrate in a atomic layer deposition chamber and apply a bottom copper barrier layer by an ALD reaction.

Claims 1, 14-16 are rejected under 35 U.S.C. 102(e) as being anticipated by Meyer (US patent Application Publication 2004/0001922).

Referring to claim 1, Meyer discloses a method for treating a substrate comprising coiling a substrate into one or more coils in such a way that adjacent turns of the coils do not touch, placing the coils in a treatment chamber and treating the coiled substrates by electrodeposition (paragraph 5, paragraph 13).

Referring to claim 14, Meyer discloses attaching an end of a roll of substrate material to a carousel, rotating the carousel while unrolling the substrate material from the roll to coil the substrate around the carousel and placing one or more spacers

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between adjacent layers of the coiled substrate before the carousel completes a turn (figure 1, paragraph 13)

Referring to claim 15, Meyer discloses that each spacer touches the back surface of the substrate but not the front (figure 1.

Referring to claim 16, Meyer discloses stacking one or more spacers on top of one another.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

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Claims 3 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chan et al. as applied to claims 1 and 2 above, and further in view of Marsh (US Patent No. 6,380,983).

Referring to claims 3 and 5, Chan et al. disclose forming a TiN layer using an ALD surface reaction (column 6 lines 55-62). Chan et al. does not disclose using  $MCl_x$  as a reactant vapor or more specifically  $TiCl_4$ . However, Marsh teaches that when forming a TiN film  $TiCl_4$  is a starting material that will yield TiN when in combination with  $NH_3$  in an ALD process (column 7 lines 34-47). Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Chan et al. to use  $TiCl_4$  when forming a TiN film as suggested by Marsh because using  $TiCl_4$  and  $NH_3$  would have reasonably been expected to successfully provide a TiN layer formed by ALD as is required by Chan et al..

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chan et al. as applied to claims 1 and 2 above, and further in view of Norman et al. (US Patent Application Publication 2002/0013487).

Chan et al discloses all of the features of claim 4 except it does not disclose exposing the substrate to water vapor during the ALD reaction. However, Norman et al. teaches that when forming copper interconnects, like those in Chan et al., for semiconductor devices it is desirable to use water as an oxidizer in an ALD reaction to bond copper to the surface before reducing the copper oxide to pure copper (paragraph 26). Accordingly, it would have been obvious to one of ordinary skill in the art at the



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time the invention was made to modify Chan et al. to use water as an oxidizing agent when depositing the Cu seed layer by ALD as taught by Norman et al. with the expectation of successfully forming copper interconnects bonded to the substrate.

Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Meyer. Meyer does not expressly teach moving the roll of substrate material around the carousel as a method of forming the coiled substrate. However, it is clear that there are only three possible ways to coil the substrate from a roll around a carousel: rotate the roll around the carousel holding the carousel stationary; rotate the carousel around its central axis while holding the roll of substrate material stationary; or rotate the roll around the carousel while concurrently rotating the carousel about its central axis. Any of these three methods would clearly be suitable to coil the substrate around the carousel and there would appear to be no advantage to performing any one of these methods over the others. Thus it would have been obvious to one of ordinary skill in the art to rotate the roll of substrate material around the carousel as opposed to rotating the carousel while holding the substrate material stationary because doing so would have been expected to successfully produce the coiled substrate required by Meyer.

Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Meyer. Meyer does not expressly teach placing two or more coiled substrates side by side. However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to place more than 1 substrate side by side during the treatment of

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the substrates with an expectation that a greater amount of treated substrate could be made in the same amount of time.

### ***Allowable Subject Matter***

Claims 22 and 23 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The subject matter of claims 22 and 23 is not taught or fairly suggested by the prior art. The closest prior art references are those relied upon above. Iszczukiewicz seeks to treat both sides of a steel strip and therefore does not suggest providing back-to-back substrates wherein one side would not be treated. Likewise, Meyer seeks to coat all sides of the wire substrate. The coiled substrate of Chan et al. is etched into a substrate and therefore does not suggest providing two substrates attached together and "coiling the dual substrate."


### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Howard E. Abramowitz whose telephone number is 571-272-8557. The examiner can normally be reached on monday-friday 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy H. Meeks can be reached on 5712721423. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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TIMOTHY MEEKS  
SUPERVISORY PATENT EXAMINER